УДК 576.895.428:599.322.3

MITES OF THE GENUS SCHIZOCARPUS TROUESSART, 1896 (ACARIFORMES: CHIRODISCIDAE) FROM THE NORTH AMERICAN BEAVERS (CASTOR CANADENSIS) IN RUSSIA

© A. V. Bochkov,[1] A. P. Saveljev[2]

[1] Zoological Institute RAS
Universitetskaya emb., 1, St. Petersburg, 199034
E-mail: andrevbochkov@gmal.com
[2] Russian Research Institute of Game Management and Fur Farming
Preobrazhenskaya St., 79, Kirov, 610000
Submitted 10.10.2014

КЛЕЩИ РОДА SCHIZOCARPUS TROUESSART, 1896 (ACARIFORMES: CHIRODISCIDAE) КАНАДСКИХ БОБРОВ (CASTOR CANADENSIS) В РОССИИ

© А. В. Бочков,[1] А. П. Савельев[2]

[1] Зоологический институт РАН
Университетская наб., 1, С.-Петербург, 199034
E-mail: andrevbochkov@gmal.com
[2] Всероссийский научно-исследовательский институт охотничьего хозяйства и звероводства им. профессора Б. М. Житкова
ул. Преображенская, 79, Киров, 610000
Поступила: 10.10.2014

Four native species of parasitic mites belonging to the genus *Schizocarpus* Trouessart, 1896 (Acariformes: Chirodiscidae) are recorded on the North American beaver *Castor canadensis* Kuhl, 1820 (Rodentia: Castoridae) from Russia. Totally ten beavers from all three main geographically isolated populations of in Russia (Leningrad Province, Voronezh Biosphere Reserve (beaver farm) and Khabarovsk Territory) were examined. Additionally, in captivity (Voronezh beaver farm) eight species were recorded switched from the Eurasian beaver *Castor fiber* Linnaeus, 1758 on *C. canadensis*.
Key words: ectoparasites, fauna, introduced species, mites, North American beaver, *Schizocarpus*.

The parasite fauna of introduced or invasive hosts usually undergoes by serious chances because they lost some their native symbionts and are colonized by local ones. The North American beaver *Castor canadensis* Kuhl, 1820 (Rodentia: Castoridae) was introduced to Finland from the USA in 1937. In

1950s it entered to Karelia and Leningrad Province (Russia). Descendants of these beaver migrants since 1969 till 1987 were translocated to the some regions of the Russian Far East (Khabarovsk Territory, Amur Province, Kamchatka, Sakhalin and Primorye Territory) and also maintained in captivity in Voronezh beaver farm (Lavrov, 1981; Safonov et al., 1983).

Among beaver-associated arthropods, mites of the genus *Schizocarpus* Trouessart, 1896 (Acariformes: Chirodiscidae) are permanent symbionts inhabiting the undercoat of these hosts and are especially numerous and species-rich. To date 67 species are described in this genus: 50 species are known from the Eurasian beaver *Castor fiber* Linnaeus, 1758 (Bochkov et al., 2012; Bochkov, Saveljev, 2012) and 17 species are from the North American beaver *Castor canadensis* (Whitaker et al., 2009). The main reasons for such example synhospitality among these mites are the geographically disjunctive ranges of various beaver populations and adaptations of different mite species to the particular microhabitats on the beaver body (Bochkov, Mironov, 2008). Species of *Schizocarpus* parasitizing both beaver species are unknown in the wild (Bochkov, Dubinina, 2011). However in captivity some mite interchanges between *C. fiber* and *C. canadensis* are recorded (Dubinina et al., 1993).

The fauna of *Schizocarpus* spp. on *C. canadensis* living in captivity in the beaver farm of the Voronezh Biosphere Reserve was explored by Dubinina et al. (1993). In the current work, we report on fauna of *Schizocarpus* spp. from all three main geographically isolated populations of *C. canadensis* in Russia (Leningrad Province, Voronezh Biosphere Reserve (farm) and Khabarovsk Territory).

MATERIAL AND METHODS

This research is based on slide material from the collection of the Zoological Institute of the Russian Academy of Sciences (ZIN). Mites were collected from ten beavers trapped in 1982—1983. Six beavers from Leningrad Province: Vyborg District, Grachevskoye Lake (GPS coordinates 29.2171319760382, 61.0665916235172), July 1983, coll. V. I. Bobrovskaya and A. P. Saveljev (locality #1, 5 beavers); Vyborg District, Lebedinoye Lake, 59°34′N, 34°34′E, 30 July 1983, coll. V. I. Bobrovskaya and A. P. Saveljev (locality #2, 1 beaver). Three beavers from the beaver farm in the Voronezh State Natural Biosphere Reserve (Voronezh Province), 51°56′44′′N, 39°34′9′′E, May—June 1982—1983, coll. V. I. Bobrovskaya. A single beaver from Khabarovsk Territory: Obor River, 48°26′56′′N, 135°27′0′′E, October 1983, coll. A. Saveljev.

ZISP specimens were compared with the type series of respective *Schizocarpus* species housed in the Institut Royal des Sciences Naturelles de Belgique, Brussels, Belgium.

Species shifted on the North American beaver in captivity are marked by an asterisk.

RESULTS

Schizocarpus paramingaudi Fain et Whitaker, 1988

Material examined. Leningrad Province (locality #1): 47 males from head (beaver #1), 25 July 1983; 3 males from head (beaver #2), 27 July 1983; 92 males from head (beaver #3), 28 July 1983; 129 males from head and 11 males from dorsum (beaver #4), 1 August 1983; 54 males from head (beaver #5), 2 August 1983; locality #2: 40 males from head.

Voronezh Province: 12 males from head (beaver #1), 31 May 1983; 1 male from dorsum (beaver #2), 22 June 1983; 3 males from head (beaver #3), 30 June 1982.

Khabarovsk Territory: 27 males from head.

Remarks. This species was recorded on *Castor canadensis* from the USA (Alaska, Massachusetts, Oregon, Indiana, and Florida) (Fain, Whitaker, 1988; Whitaker et al., 2009). It was recorded on *C. canadensis* in Voronezh Farm (Dubinina et al., 1993). A few individuals of this species (misidentified as *S. mingaudi* Trouessart, 1896) were recorded on the Eurasian beaver from Voronezh beaver farm by Dubinina (1964). These specimens undoubtedly shifted on the Eurasian beavers from *C. canadensis* in captivity. *Schizocarpus* spp. common to these hosts are absent in the wild (Bochkov et al., 2012).

Schizocarpus inversus Fain, Whitaker et Smith, 1984

Material examined. Leningrad province (locality #1): 2 males from abdomen (beaver #3), 28 July 1983; 1 male from head (beaver #5), 2 August 1983; locality #2: 1 male from head.

Voronezh Province: 1 male from abdomen (beaver #1), 31 May 1983.

Remarks. This species was recorded on *Castor canadensis* from the USA (Alaska, Massachusetts, Indiana, Main, and Florida) (Fain et al., 1984; Whitaker et al., 1989, 2009). It was recorded on *C. canadensis* in Voronezh beaver farm (Dubinina et al., 1993).

Schizocarpus centralis Fain et Whitaker, 1988

Material examined. Leningrad Province (locality #1): 1 male from dorsum and 1 male from head (beaver #1), 25 July 1983; 8 males from dorsum (beaver #4), 1 August 1983.

Voronezh Province: 1 male from dorsum (beaver #1), 31 May 1983.

Remarks. This species was recorded on *C. canadensis* from the USA (Alaska) (Fain, Whitaker, 1988) and it has never been recorded in the wild from other localities. It was recorded on *C. canadensis* in Voronezh beaver farm (Dubinina et al., 1993).

Schizocarpus spinifer Fain, Whitaker et Smith, 1984

Material examined. Voronezh Province: 1 male from dorsum (beaver #1), 31 May 1983.

Remarks. This species was recorded on *Castor canadensis* from USA (Alaska, Massachusetts, Indiana, Main, and Georgia) (Fain et al., 1984; Whitaker et al., 1989, 2009). It was recorded on *C. canadensis* in Voronezh beaver farm (Dubinina et al., 1993).

**Schizocarpus anomalis* Bochkov, 1993

Material examined. Voronezh Province: 1 male (holotype ZISP T-Ch-1) from head (beaver #3), 30 June 1982.

Remarks. This species was described from a single male specimen collected from captive *C. canadensis* (Voronezh beaver farm) (Dubinina et al., 1993). As it was mentioned in the original description, it is morphologically similar to the species parasitizing the Eurasian beaver and, probably, shifted on *C. canadensis* in captivity. To support of this suggestion, a large series of this species (56 males) was recently collected from *C. f. belorussicus* in the wild: Belorussia, Minsk Province, Vologin District, middle-stream of West Berezina River, 54°10′N, 26°15′E, December 2007, coll. A. P. Saveljev (present paper).

**Schizocarpus subhexapilis* Fain et Lukoschus, 1985

Material examined. Voronezh Province: 2 males from head (beaver #3), 30 June 1982.

Remarks. This species was recorded from *C. fiber* from unknown locality in Europe, Poland (Suwałki), and Russia (Voronezh Reserve) (Fain, Lukoschus, 1985; Bochkov, Dubinina, 2011; Bochkov et al., 2012). It was recorded on *C. canadensis* in Voronezh beaver farm (Dubinina et al., 1993).

**Schizocarpus grandis* (Dubinina, 1964)

Material examined. Voronezh Province: 10 males from head (beaver #1), 31 May 1983; 7 males from head (beaver #2), 22 June 1983; 4 males from head (beaver #3), 30 June 1982.

Remarks. This species was recorded on *C. fiber* from unknown locality in Europe, Russia (Voronezh Reserve and Tuva) (Dubinina, 1964; Fain, Lukoschus, 1985; Bochkov, Saveljev, 2012). It was recorded on *C. canadensis* in Voronezh beaver farm (Dubinina et al., 1993).

**Schizocarpus latus* (Dubinina, 1964)

Material examined. Voronezh Province: 3 males from dorsum (beaver #1), 31 May 1983; 4 males from dorsum (beaver #2), 22 June 1983; 5 males from flanks (beaver #3), 30 June 1982.

Remarks. This species was recorded on *C. fiber* from unknown locality in Europe (unknown locality) and Russia (Voronezh Reserve) (Dubinina, 1964; Fain, Lukoschus, 1985). It was recorded on *C. canadensis* in Voronezh beaver farm (Dubinina et al., 1993).

Schizocarpus numerosus (Dubinina, 1964)

Material examined. Voronezh Province: 42 males from dorsum and 25 from flanks (beaver #1), 31 May 1983; 42 males from dorsum (beaver #2), 22 June 1983; 48 males from dorsum (beaver #3), 30 June 1982.

Remarks. This species was recorded on *C. fiber* from Germany (Elba River), Poland (Suwalki), and Russia (Voronezh Reserve) (Dubinina, 1964; Fain, Lukoschus, 1985; Bochkov et al., 2012). It was recorded on *C. canadensis* in Voronezh beaver farm (Dubinina et al., 1993).

Schizocarpus parvus (Dubinina, 1964)

Material examined. Voronezh Province: 12 males from posterior legs (beaver #1), 31 May 1983; 2 males from abdomen and 3 from posterior legs (beaver #2), 22 June 1983; 8 males from abdomen and 4 males from dorsum (beaver #3), 30 June 1982.

Remarks. This species was recorded on *C. fiber* from Poland (Suwalki) and Russia (Voronezh Reserve) (Dubinina, 1964; Bochkov et al., 2012). It was recorded on *C. canadensis* in Voronezh beaver farm (Dubinina et al., 1993).

Schizocarpus subparvus (Dubinina, 1964)

Material examined. Voronezh Province: 3 males from dorsum (beaver #1), 31 May 1983.

Remarks. This species was recorded on *C. fiber* from Poland (Suwalki) and Russia (Voronezh Reserve) (Dubinina, 1964; Bochkov et al., 2012). It was recorded on *C. canadensis* in Voronezh beaver farm (Dubinina et al., 1993).

Schizocarpus minor (Dubinina, 1964)

Material examined. Voronezh Province: 3 males from dorsum (beaver #2), 22 June 1983.

Remarks. This species was recorded on *C. fiber* from Russia (Voronezh Reserve) (Dubinina, 1964). It was recorded on *C. canadensis* in Voronezh Farm (Dubinina et al., 1993).

DISCUSSION

The North American beavers introduced to Finland have originated from a few individuals and, therefore, the fauna of *Schizocarpus* spp. on their descendants is represented by only four mite species being passed via «bottleneck». Among them, *S. mingaudi* is the dominant species with the widest occupied microhabitat on the host body; it was recorded on all examined beavers in North America; *S. spinifer* and *S. inversus* are known from most examined localities in North America, except for beavers from Florida and Georgia, respectively

(Whitaker et al., 1989, 2009). *S. centralis* is known in the wild only from Alaska (Whitaker et al., 2009).

In captivity (Voronezh farm), eight mite species switched from *Castor fiber* to *C. canadensis*: *S. anomalis*, *S. grandis*, *S. latus*, *S. numerosus*, *S. parvus*, *S. subhexapilis*, *S. subparvus*, and *S. minor*. *Schizocarpus anomalis* described from *C. canadensis* in this farm (Dubinina et al., 1993) was also recorded in the wild from *C. fiber* (*subspecies belorussicus*) (present paper). Among «invaders» the most abundant species on *C. canadensis* was *S. numerosus*, the dominant species having the widest microhabitat on the body of the Eurasian beaver (Dubinina et al., 1993). Reciprocally, mite shifts in the opposite direction (from *C. canadensis* to *C. fiber*) happened at this farm were recorded by Dubinina (1964) only for *S. paramingaudi* (misidentified as *S. mingaudi*), the most abundant parasite of *C. canadensis* (Whitaker et al., 1989). In the future, it could possibly be expected then that the beavers reintroduced in the wild from the Voronezh beaver farm could possess the «chimerical» fauna of *Schizocarpus* species.

ACKNOWLEDGEMENTS

We thank V. I. Bobrovskaya who collected most of the mite specimens used in this study. This research was supported by a grant from the Russian Science Foundation RSF 14-14-00621.

References

Bochkov A. V., Dubinina H. V. 2011. Mites of the genus *Schizocarpus* (Acariformes: Chirodiscidae) parasitizing the Eurasian beaver *Castor fiber* (Rodentia: Castoridae) in the Voronezh National Reserve. Acarina. 19: 53—66.

Bochkov A. V., Labrzycka A., Skoracki M., Saveljev A. P. 2012. Fur mites of the genus *Schizocarpus* Trouessart (Acari: Chirodiscidae) parasitizing the Eurasian beaver *Castor fiber belorussicus* Lavrov (Rodentia: Castoridae) in NE Poland (Suwalki). Zootaxa. 3152: 39—59 [in Russian].

Bochkov A. V., Mironov S. V. 2008. The phenomenon of «phylogenetic synhospitality» in acariform mites (Acari: Acariformes) — the permanent parasites of vertebrates. Parazitologiya. 42: 81—100 [in Russian].

Bochkov A. V., Saveljev A. P. 2012. Fur mites of the genus *Schizocarpus* Trouessart (Acari: Chirodiscidae) from the Eurasian beaver *Castor fiber tuvinicus* Lavrov (Rodentia: Castoridae) in the Azas River (Tuva Republic, Russia). Zootaxa. 3410: 1—18.

Dubinina E. V. 1964. Mites of the genus *Histiophorus* (Listrophoridae) parasites of beavers. Parazitologicheskiy Sbornik, 22: 111—152 [in Russian].

Dubinina E. V., Bochkov A. V., Bobrovskaja V. I. 1993. Notes on systematics of mites of the genus *Schizocarpus* (Acariformes: Chirodiscidae). Parazitologiya. 27: 450—453 [in Russian].

Fain A., Lukoschus F. S. 1985. The genus *Schizocarpus* Trouessart, 1896 (Acari, Chirodiscidae) from the beaver *Castor fiber* L. An example of multiple speciation. Entomologische Abhandlungen. 49: 35—58.

Fain A., Whitaker J. O. Jr. 1988. Mites of the genus *Schizocarpus* Trouessart, 1896 (Acari, Chirodiscidae) from Alaska and Indiana, USA. Acarologia. 29: 395—409.

Fain A., Whitaker J. O. Jr., Smith M. A. 1984. Fur mites of the genus *Schizocarpus* Trouessart, 1896 (Acari, Chirodiscidae) parasitic on the American Beaver *Castor canadensis* in Indiana, U. S. A. Bulletin and Annales de la Societe royale Belge d'Entomologie. 120: 211—239.

Gromov I. M., Erbajeva M. A. 1995. The mammals of Russia and adjacent territories. Lagomorphs and rodents. Zoological Institute RAS, St. Petersburg. 522 p.
Whitaker J. O. Jr., Fain A., Jones G. S. 1988. Ectoparasites from beavers from Massachusetts and Maine. International Journ. of Acarology. 15: 153—162.
Whitaker J. O. Jr., Ruckdeschel C., Bochkov A. V. 2009. Species of the genus *Schizocarpus* Trouessart, 1896 (Acari: Chirodiscidae) from Florida and Georgia beavers. Florida Scientist, Biological Sciences. 72: 18—21.